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## Monitoring maximum peak power density values as a more reliable marker for measurement procedures to elucidate RF EMF health effects: Leganes project

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### Introduction

The current time-varying EMF measurement procedures applied in most parts of the world are all based on the recommendations of some organizations (ICNIRP, ANSI [1], etc). In Europe the legislations mostly follow the ICNIRP [2] recommendation, which has been revised in 2009, and that makes some recommendations for the measurements limits and units.

Mobile communications are formed by modulated frequencies and transmitted by sequenced pulses, so we consider that the temporal average criterion applied currently does not show properly the real intensity that the human body receives, and arises from considering only thermal effects. Actually we are working with short EM pulses (~μs long) to elucidate if contribute negatively in human health. In this context, we are developing a real time monitoring system to record 24 hours per day, 365 days per year. The difference that we propose for the measurement lies in the conviction that the instant power density (Seq) plays a leading role in non-thermal effects of RF EMF health effects, and it must be analyzed during long exposition (daily exposition).

### Materials y methods

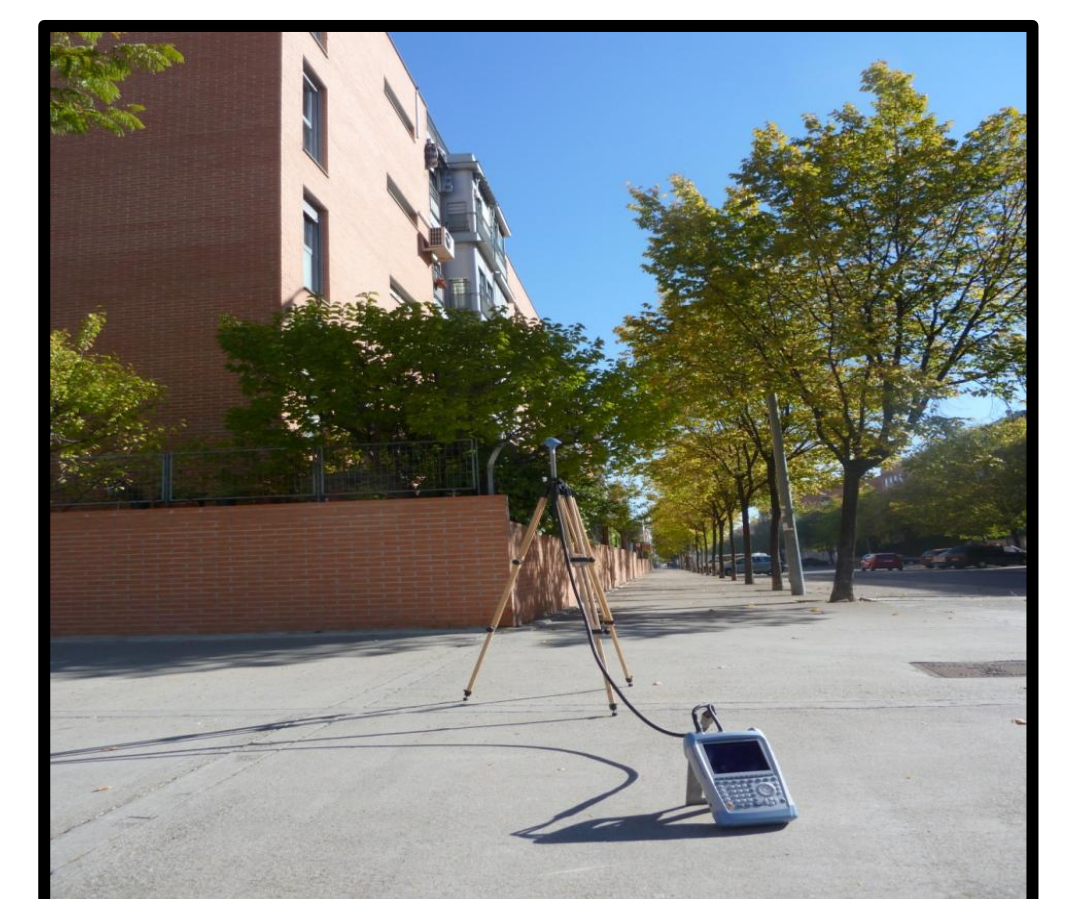
#### Equipment

- Handheld Spectrum Analyzer FSH8, Rohde & Schwarz. Calibrated June 2010.
- Isotropic Sensor RSEMF26. Calibrated June 2010



#### Procedure

- 105 measurement points
- The measured parameter is the peak RMS density power [W/m<sup>2</sup>]
- The limits of the band were fixed for this first stage from 700MHz to 2497 MHz
- In this broadband, a non regular 4 step division is done: GSM 900, DCS, IMT and WIFI.
- The captures are obtained during six minutes, using the MAX HOLD function, to keep the highest values of each band frequency in each point.

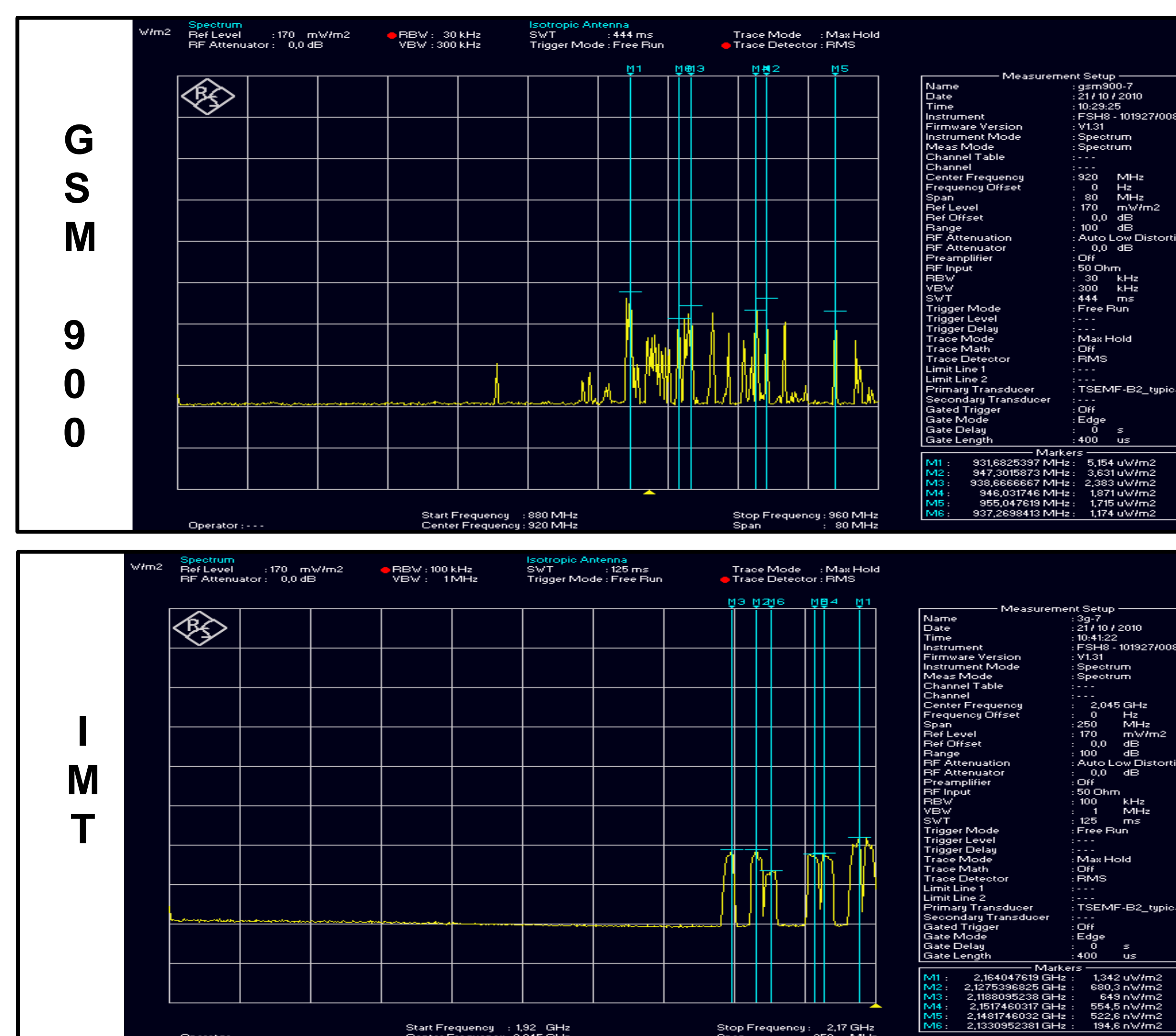
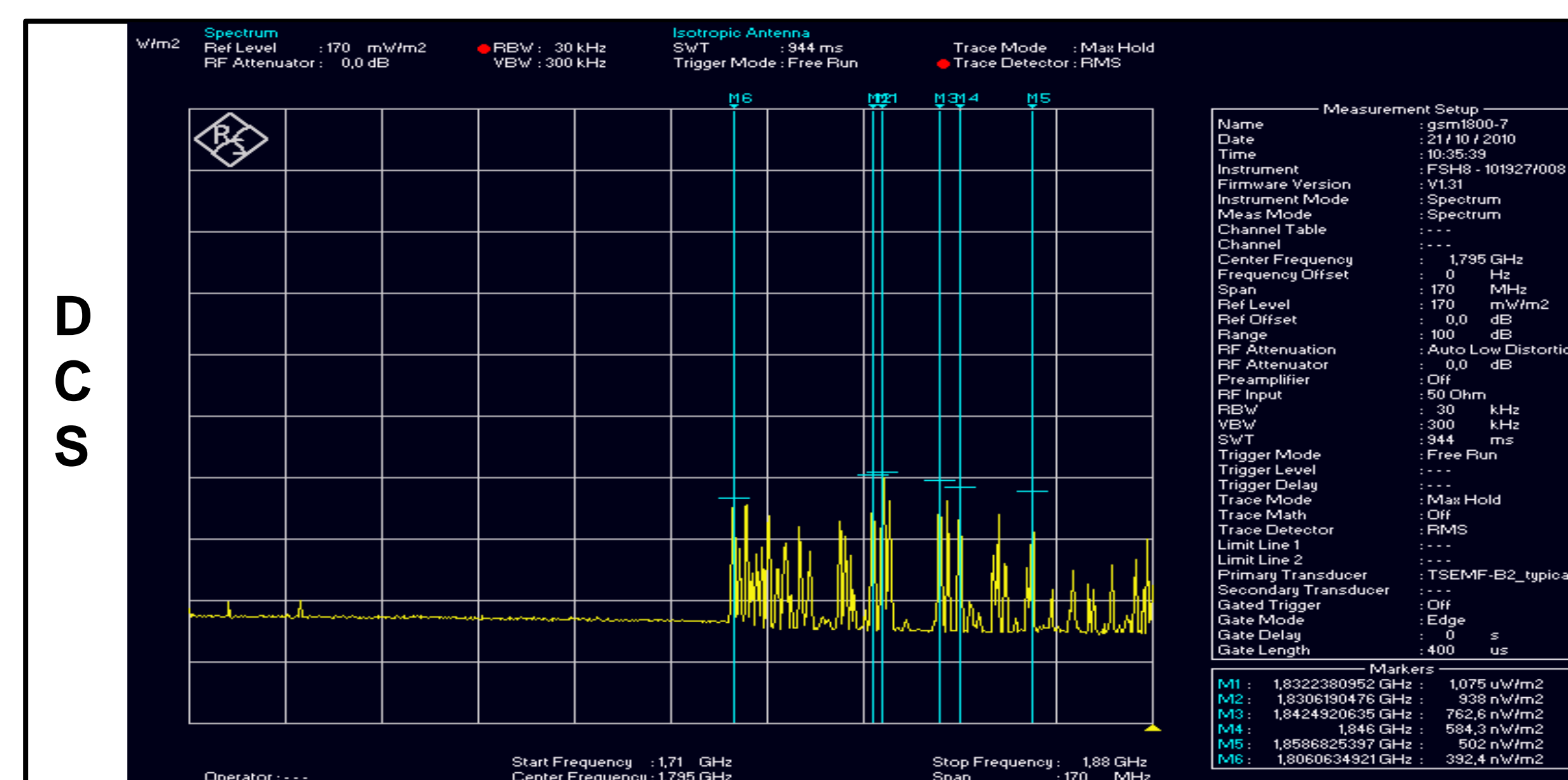


Example of acquisition

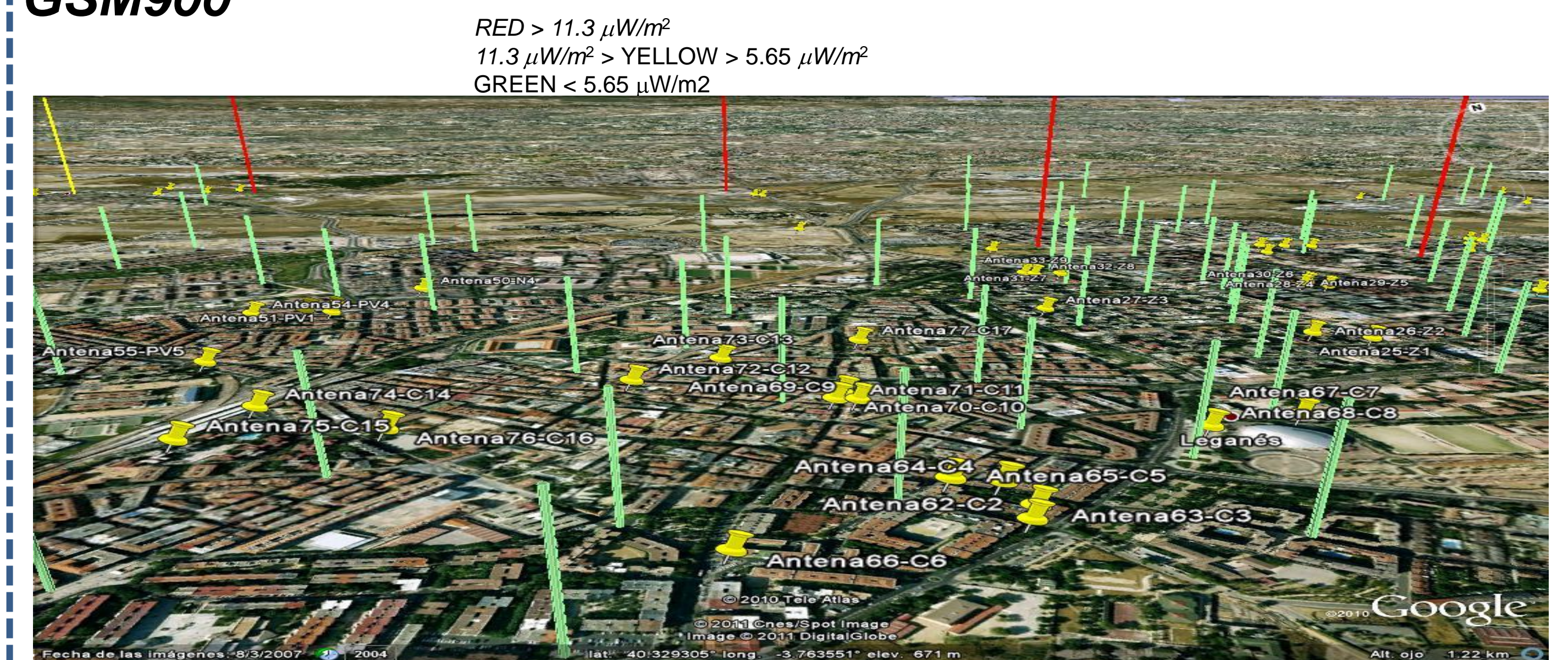
### First Results

Next images are shown as example of one measurement point.

The markers are placed in the maximum values, which were after used to create a database, and then introduced in a script to generate the corresponding maps



Example of map generated using a MATLAB® Toolbox for Google Earth®. The displayed measure correspond to GSM900



Example. In each point, stored up to six values with its frequencies

GSM900		DCS		IMT	
Frec (MHz)	I (nW/m <sup>2</sup> )	Frec (MHz)	I (nW/m <sup>2</sup> )	Frec (MHz)	I (nW/m <sup>2</sup> )
946.031	113000	1830.62	17160	2152.14	8564
937.27	38610	1806.06	10110	2146.58	7566
931.68	37180	1872.714	6752	2161.66	5587
938.666	32640	1842.494	6197	2119.2	2656
934.85	783.9	1846	6057	2128.73	333.2
944.63	684.4	1857.87	5631	2132.3	301.1

### Conclusion and Future

The measurement method here proposed differs from the current normative mainly in one aspect: we give more importance to the instant peak values instead of the average. Through the project that is currently being executed in Leganés, we aim to generate a large database with real information about the peak intensity values, quick changes in amplitude, pulse width, etc, through the day, to elucidate if there is relation with human health damage. This communication does not intend to refute the current measurement methods of the ICNIRP recommendation, but to suggest a new approach that corresponds with the hypothesis managed in our research group. We consider that ICNIRP recommendation is a direct consequence of considering only thermal effects as responsible to health effects, where time of exposure is tightly related with possible harmful effects in humans, and we do not share completely the procedure to calculate and to apply the restriction criteria for the peak values (1,000 times the Seq). Our goal is to develop a real time measurement system for continuous monitoring. We are developing a new technology capable of continuously monitoring instant values and will also include the ICNIRP recommendation. The project conclusion will be a comparison between the results obtained using the proposed measurement method versus the results using the ICNIRP recommendation (6 minutes average). We expect to have the data comparison in the next 18 months.

### References

- [1] ANSI/IEEE, "IEEE STANDARD FOR SAFETY LEVELS WITH RESPECT TO HUMAN EXPOSURE TO RADIO FREQUENCY ELECTROMAGNETIC FIELDS, 3KH TO 300 GHZ", 1992.
- [2] ICNIRP, "GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, MAGNETIC, AND ELECTROMAGNETIC FIELDS (UP TO 300 GHz)", 2009

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